

# **Fabrication of omnidirectional photonic band gap structures for photonic devices in the near infrared and visible frequencies**

G. Subramania

Sandia National Laboratories, Org 01743, P.O. Box 5800, Albuquerque, NM ,USA

We describe the fabrication of a three dimensionally periodic crystal structure with omnidirectional band gap for devices in the near-IR and visible wavelength region using a technique of direct electron beam write coupled with multi-level alignment. This technique will allow us to fabricate prototype photonic band gap device structures with different materials in a direct way to test the effects of omnidirectional photonic gap on various optical phenomena (e.g. spontaneous emission, localization etc.). To demonstrate feasibility of this method we have successfully fabricated Iowa State “woodpile” structures with lattice spacings in the  $\sim 0.5 \mu\text{m}$  range. Prototype structures in the near-IR fabricated with silicon give a wide stop band in the stacking direction centered around  $1.5 \mu\text{m}$  wavelength (figure 1) consistent with previously published structures. Woodpile structures fabricated with gold reveal a sharp band edge near  $\sim 1.0 \mu\text{m}$  wavelength with a broad high reflectivity region (close to 100%) for larger wavelengths. In this presentation we will describe the fabrication processes used and present optical characterization data from various structures.

The research at Sandia National Laboratories is supported by U.S. Department of Energy Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy’s National Nuclear Security Administration under contract DE-AC04-94AL85000.

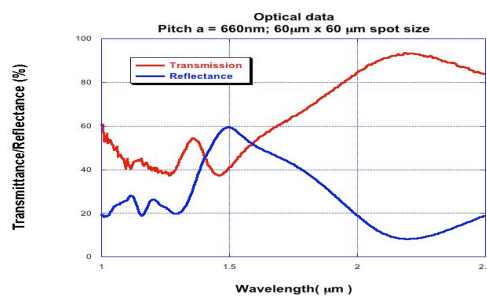
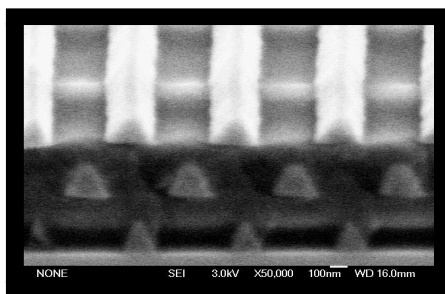


Figure 1.